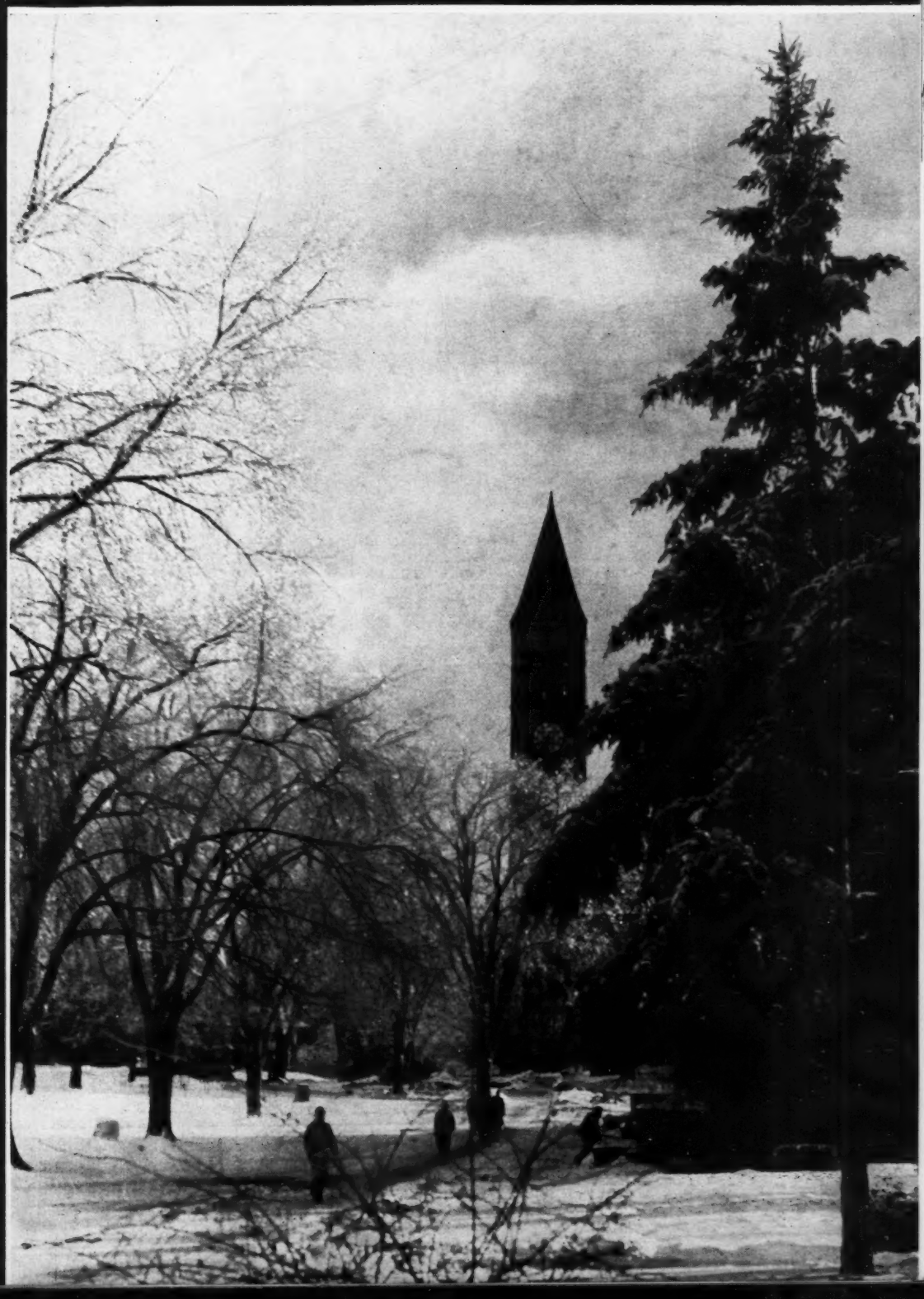
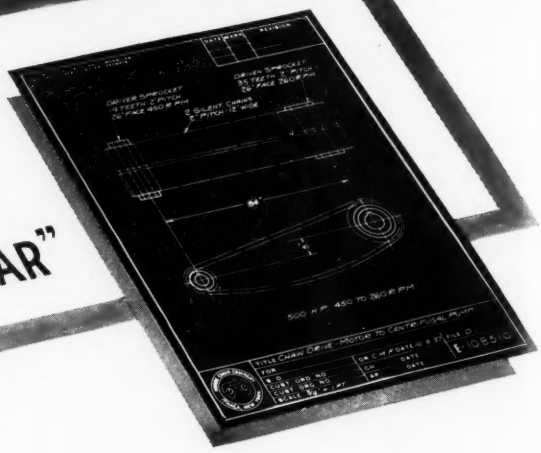
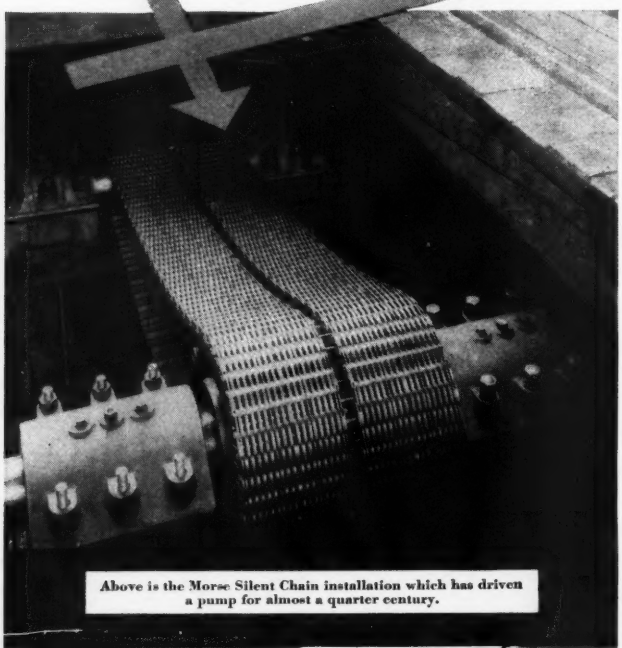
The CORNELL ENGINEER

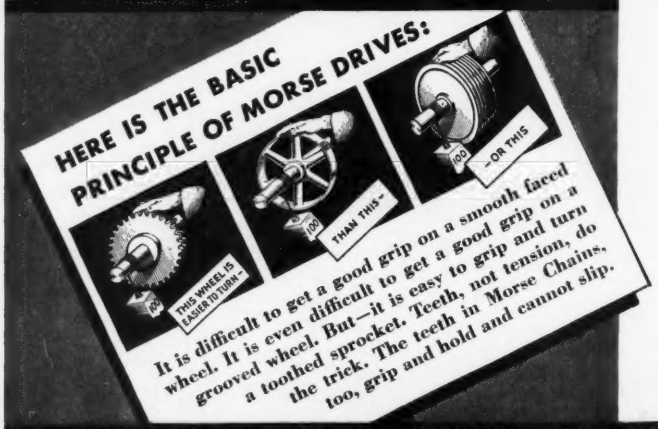


THIS MORSE SILENT CHAIN, 23 YEARS OLD, is now beginning to show a LITTLE WEAR"





Above is the Morse Silent Chain installation which has driven a pump for almost a quarter century.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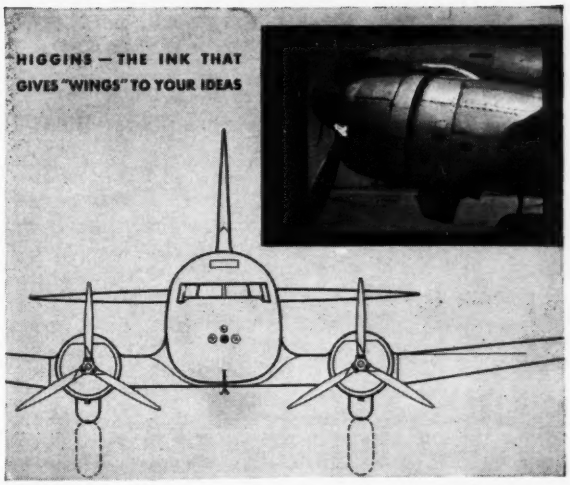

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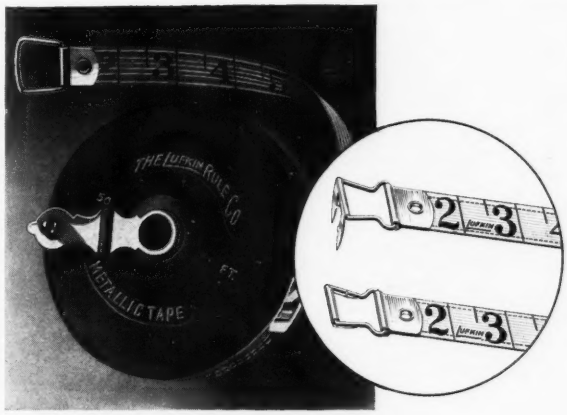

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This Month and Next

A Glimpse of our Authors

LT. COMDR. R. E. BASSLER, (CEC) USN, CE '17 who writes so vividly "A Hurricane Runs Wild" "joined" the Navy after graduation in 1917. He worked in the Bureau of Construction and Repair until 1923 as an Aeronautical Engineer and as Assistant to the Ordnance Station Project Manager. During the next three years he was Transportation Officer at the Navy Yard in New York. From 1926 to 1928 he was Public Works Officer at Guantanamo Bay, Cuba. Commander Bassler was stationed in Philadelphia as Power Superintendent at the Navy Yard for a year, and as Plant Superintendent of the Naval Aircraft Factory for three years. In 1932 he was appointed Public Works Officer at the Fleet Air Base in the Canal Zone. He was transferred to his present post as Public Works Officer of the U. S. Submarine Base, New London, Connecticut in 1935.

•

RALPH A. TUDOR, C.E. '25 takes us across the continent to the "San Francisco World's Fair". Mr. Tudor is the Assistant Executive Officer of the California Commission for the Golden Gate International Exposition. Following four years at West Point he took graduate work in the School of Civil Engineering at Cornell for two years. He returned to active duty with the Army Corps of Engineers following graduation. In 1929 he joined the engineering forces of the San Francisco-Oakland Bay Bridge Division of the California Department of Public Works. He served first as Senior Designing Engineer and later as Senior Bridge Engineer. Many will remember his article "The San Francisco-Oakland Bay Bridge" which was printed in the October 1934 issue of THE CORNELL CIVIL ENGINEER.

DANIEL H. SEIPT, EE '40, writes on the uses of cathode ray equipment. Dan is a member of the Junior Editorial Board of THE CORNELL ENGINEER. In writing on "Cathode Rays" he explains to many outside the electrical field the signficance of these oft used but rarely explained terms.

•

EDMUND B. KING, CE '41, describes in "Microbe Death Rays" the invention of Rentschler and James of the Westinghouse Research Laboratory. Mr. King is a member of the Sophomore Editorial Staff of THE CORNELL ENGINEER. In case the title seems ambiguous the rays spell death to the microbes, not by them.

•

Next Month

The Chemical Engineer steps into the field of Plant design. Next month we learn his technique of designing a Sodium Hydroxide plant and his method of analyzing the economic and scientific problems.

Copper-covered steel wire has many uses in modern America. Mr. T. C. McIlvaine describes these for us in the March issue.

Tell Berna, Geneva Manager of the Natinal Machine Tool Builders' Association, will write on the topic "Machine Made Jobs."

To those who wonder at the number of recent articles devoted to the eastern and western expositions, it should be noted that these provide design and planning problems in many engineering lines not usually found on the same scale or with the same background.

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Microbe death rays in action: the Sterilamps are the four long, tubular lamps surrounding the main lamp.

MICROBE DEATH RAYS

A New and Effective Method of Destroying Bacteria Under Adverse Conditions

By E. B. KING, C.E. '41

EVER since the preventive powers of sterilization were demonstrated by Pasteur and Lister, great strides have been taken in the discovery of ways to kill bacteria with heat or chemicals. Food handlers, applying heat to the preservation of food, had in some cases notable success, but in others, only success in part—as, for example, in the pasteurization of milk. If all the bacteria were killed by the application of heat, no taste would remain; therefore we do not completely kill all the bacteria in milk. Even though pasteurized, milk must be carefully handled and soon used, else the bacteria remaining in it will quickly produce souring.

Neither heat nor chemicals can be successfully applied to the preservation of such perishables as meat. Refrigeration is invariably attended by loss of moisture and flavor, or even the growth of mold. No practical method of chemical washing or heat treatment has yet been devised for the destruction of microbes on drinking glasses. In addition, heat and chemical methods are limited to small areas and small surfaces, and are essentially two-dimensional in action, while the greatest sea of disease-producing organisms is the air, against which human beings have no protection except their bodies' internal defenses. (The sterilizing power of sunlight is relatively feeble.)

It has been known for some time that the ultraviolet spectrum (See Fig. 1) contains many different wave-lengths, some having no effect on bacteria, while others have special effects, such as tanning the skin. Ordinary ultraviolet lamps emit most of these wavelengths, but appreciable power is necessary to produce this long spectrum. In addition, they operate hot, they are expensive to make, they may be dangerous, and their bacteriacidal effect is low in efficiency. Hence they are quite impractical for widespread use.

THE DEVELOPMENT OF THE RENTSCHLER-JAMES STERILIZATION PROCESS

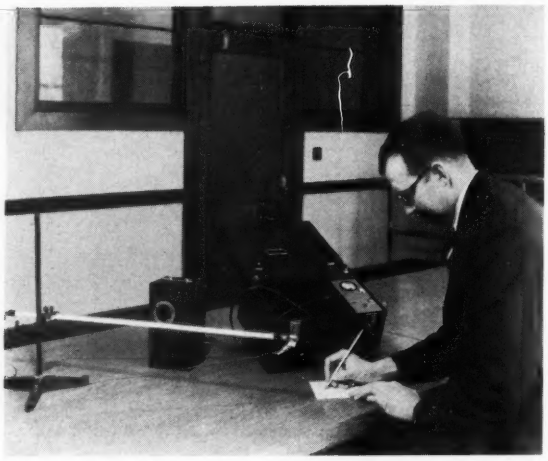
Two men have been at work for more than five years, seeking a solution to the problem of practical light-sterilization. They are Dr. Harvey C. Rentschler, and his associate, Dr. Robert F. James, both employed by the Westinghouse Co.

Since it was believed that some undefined portions of the ultraviolet spectrum were more deadly to micro-organisms than others, Dr. Rentschler set to work to invent a meter which would measure accurately the amount of invisible radiation of any selected wavelength being emitted by his experimental lamps. His ultraviolet meter, a photo cell using tantalum as the active material, was the outcome of his prelimimary research.

The two scientists then devised a rapid method of testing the effect of various ultraviolet wave-bands upon every known genus of bacteria and other micro-organisms, registering those found to be most desirable on the ultraviolet meter. They confirmed the belief that some portions of the ultraviolet were more deadly than others to microbes. The wave-band which appeared to be the most effective is designated as the 2537 Angstrom unit band, the Angstrom being about 1/260,000,000 of an inch.

How the determination of bacterial action of ultraviolet radiation or any other agent is made is a story in itself. Two culture plates are seeded with the same number of organisms by means of a spray, one plate being then exposed to the agent under test while the other plate is not so exposed. Both plates are placed in an incubator maintained at the proper temperature until the colonies are grown. The bactericidal action is readily calculated from the reduction in the number of colonies. Each seeded plate to be tested is exposed to a definite measured amount of radiation, which is accomplished by means of Dr. Rentschler's ultraviolet meter, the photo cell and plate to be exposed being placed side by side at the same distance from the ultraviolet light source. Once the necessary radiation to kill a definite percentage of organisms has been determined, the meter may be used quickly to measure the killing action of radiation under a given condition without having to resort to exposure and incubation of culture media.

The following are important results of radiation on micro-organisms found by use of seeding and measuring the amounts of radiation applied:



Laboratory test on the Sterilamp.

1. The amounts of radiation required to kill different kinds of bacteria, molds, and yeasts are very different. 7 clicks with photo cell kill typhoid bacteria as effectively as 100 destroy black mold spores.
2. Ozone in suitable concentration has definite germicidal powers, but in concentrations obtained from a discharge lamp, the effect of ozone is negligible compared with the effect from the ultraviolet light radiation.
3. Organisms continually cultured on media for a period of years are no more and no less resistant to radiation than the same type of organisms taken from their natural habitat and cultured on laboratory media.
4. There is very little, if any, difference in average resistance of bacteria in an old and in a new culture.
5. By method of controlled exposures, bacteria exposed while floating in the air and allowed to settle on sterile plates have been destroyed about five to ten times as effectively as the same bacteria allowed to settle on similar plates and afterwards exposed to the same amount of radiation.

The determination of the correct Angstrom unit band for the most effective results made, the two scientists began to devise a lamp which would be inexpensive to operate and of such shape as to provide the greatest germ-killing power over the area to be sterilized. They knew it had to be a gas-discharge lamp. They knew the lamp would have to contain a little mercury vapor, which is rich in the line 2537 Angstroms, and also other light-emitting gases, whose effects when electricity passed through the tube would heighten the emission of 2537 Angstroms and suppress emission of other wave-lengths of light. They knew also that a special type of glass had to be used, since ordinary glass absorbs about 90% of the ultraviolet rays. Their answer to the right kind of glass to be used was found in the laboratory, and the first "Sterilamps" were created.

In the "Sterilamp", about 80% of the radiation generated by the discharge falls very near the bactericidal spectrum and yet there is produced a negligible amount of ozone. The lamp requires only ten watts of energy; it has a continuous life of about 4000 hours; it can be safely operated by the layman; and it is reliable in operation.

The task, however, was not yet finished. The process still had to be proved in practice. Drinking glasses in nearby bars, soda fountains, restaurants, and cafeteries were selected from the shelves where "clean" utensils were kept. These were touched, lip downward, in sterile culture media, and were set away to incubate. In a few days, colonies that had grown to visible size told the story of contamination on the lips of even the "cleanest" glasses. Other glasses from the same place were chosen at random, treated first to the rays of the lamp, and then touched to fresh sterile culture media. Most of the plates in a few days' time showed no colonies whatever. A few showed one or two.

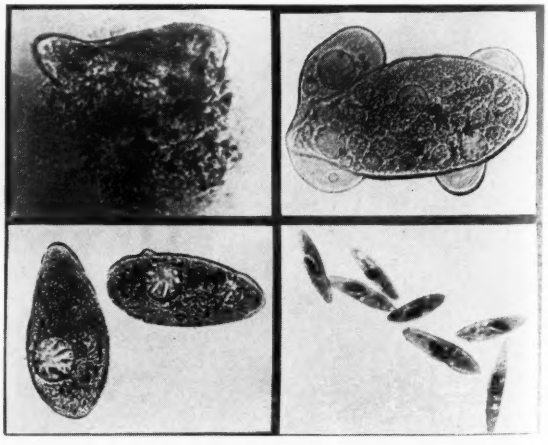
Other scientists quickly saw that the new process of sterilization with ultraviolet radiation promised not only a quick, inexpensive, and effective way to sterilize foods and eating utensils that no chemical or heat treatment could produce, but that it also offered a third dimension in sterilization: the new lamp could kill air-borne organisms, and might provide a way for controlling many air-borne diseases, just as chemical sterilization of water now controls epidemics of typhoid.

Applications of the New Process

The variety of fields in which this lamp may eventually be applied appears to be virtually limitless. From the radiation on cosmetics to the sterilization of the air in front of tellers' windows in banks, the new process has found many fields in which to serve mankind.

Several manufacturers of products have installed lamps in the air ducts of their air-conditioning systems, and it was found that 90% of the air-borne bacteria

(*Continued on page* 22)



Upper left, normal paramoecea. Upper right and lower left, the bacteria begin to swell under the lamp's action. Lower right, bacteria destroyed by internal explosion.

A Hurricane Runs Wild

The New England Hurricane from the Submarine Base at New London, Conn.

By R. E. Bassler, '17 C.E.
Lieut. Commander, U. S. N.

The hurricane at its height, about 5:00 p.m. Sept. 25.

A STORM disturbance of hurrican proportions, originating in the West Indies, failed to follow its usual track to the northeast and dissipate itself at sea. Instead, it was attracted to an unusual low pressure area in New England, passed over a section of Long Island, and struck Eastern Connecticut and Rhode Island. Fort Wright, on Fishers Island, N. Y., the Submarine Base at New London, and Naval activities at Newport, R. I., were among the defense posts which suffered severe damage.

The following readings were obtained from the barograph at Coast Guard Base 4, Fort Trumbull:

September 20, 1938,	Noon	30.02
	Midnight	29.91
September 21, 1938,	7:00 a. m.	29.78
	Noon	29.72
	1:00 p. m.	29.56
	2:00 p. m.	29.39
	3:00 p. m.	29.29
	4:00 p. m.	28.70
	4:45 p. m.	28.49
	6:00 p. m.	28.86
	7:00 p. m.	29.46
	8:00 p. m	29.45
	9:00 p. m.	29.50

The Harvard Meteorological Observatory records indicate that the wind velocity remained continuously above 60 miles per hour for three hours; for one of these hours the average was 83 miles per hour; for one-half hour, the maximum wind velocity averaged 94 miles per hour. For three five-minute periods, the wind velocity was 111 miles per hour and gusts of 173 and 186 miles per hour were recorded. All local anemometers were carried away.

In addition to wind damage, great damage was occasioned by the abnormal storm tide of about 10 feet above mean high water. Sixty percent of the lower Submarine Base area was covered by the storm tide water and many of the buildings flooded. The power plant had four feet of water in the engine room, but was able to keep operating through using steam driven auxiliaries until debris was swept into the plant and damaged oil lines leading to the oil burners. Even then the Base power plant continued to function almost three hours after the Connecticut Power Company's plant failed to supply the city of New London with electric power. This was due to the fact that falling trees put the Connecticut Power lines out of commission whereas all lines on the Submarine Base are carried underground and therefore immune to the type of damage suffered by the Power Company's transmission lines.

Hundreds of cars on the Base were submerged up to the windshields and large timbers and piles were carried by the high water through parking areas damaging the cars physically.

The fifteen thousand gallon oil tank on Pier "H" was carried off its foundation and threatened to batter into the USS CACHALOT which was moored alongside the pier. Personnel on the CACHALOT placed lines around the tank and successfully stopped it three feet from the submarine. The steel sash in many

Submarines R-4 and R-13, at left, are both docked at a submerged pier. The electric crane, right, is also docked. The piers were submerged under ft. of water.

buildings was blown in and destroyed. The five ply built-up roofing of the power plant was completely torn off. The Administration Building was completely unroofed and the slate shingles menaced life for a distance of four hundred feet from the building.

When rehabilitation commenced a composition shingle roof was placed on the Administration Building within five days.

To give some further idea of the damage of the storm, the Merritt-Chapman & Scott Corporation's fleet of tugs and derrick lighters suffered severely. One lighter was torn loose and driven through several docks with many slips for pleasure craft and finally tossed on the beach near Fort Trumbull. Several of the other lighters were sunk with one tug. The captain of the other tug, realizing conditions, slipped away from the dock and attempted to run out into the storm. However, he shipped so much water and since he could make no headway but lost ground and was in danger of being tossed back into the Thames River highway bridge, he ran his boat on the beach alongside the bridge. He was then able to pump the boat out and as soon as the water commenced to fall, which occurred about the same time as wind abatement, he backed the tug off the beach where he was in danger of being left high and dry. Another lighter of the Merritt-Chapman & Scott Corporation was loaded with sheet steel piling and ready to proceed to an assignment. This lighter was driven into a house and after the storm tide had receded, most of the sheet steel piling was overboard, the lighter was hopelessly wrecked, and the foundation of the house was approximately half gone with half of the house now supported on the remains of the lighter.

The Electric Boat Company also suffered damage when a barge was thrown into the marine railway damaging the railway extensively.

Houses in general were damaged either through the stripping of roofing material from the building, the falling of trees into houses, or by the water which broke into those houses lying along the waterfront. The greatest of this latter type of damage occurred in the area east of Westerly, Rhode Island. Hundreds of houses were located on a beach on the ocean front with the bay behind. The storm tide greatly reduced the width of the spit of sand and left about five buildings out of five hundred or more. It was here that the death toll was greatest, houses and hundreds of people being swept into the bay.

Small craft of the U. S. Coast Guard went into Shaw's Cove, a small bay near Fort Trumbull, where they successfully rode out the storm. However, as luck would have it, a trap rock laden barge was jammed into the New Haven Railroad bridge at the entrance to the cove and was sunk in that position preventing the egress of the Coast Guard boats which were sorely needed after the hurricane and flood. The dynamiting of the barge quickly cleared a path for them. The lighthouse tender TULIP was cast ashore where its bow broke through the eastbound track of the New York, New Haven & Hartford Railroad. The stern was also practically ashore and its defloating was accomplished by Merritt-Chapman & Scott by dredging a basin beneath and outboard from the ship. The U. S. Army boats traveling between Fort Wright on Fishers Island and New London were also cast partially on shore and had to be refloated. Railroad track washouts, the sinking or casting ashore of practically all floating craft, the destruction of practically all docks, the complete failure of power and telephone lines which left New London in darkness and without communication, the destruction of thousands of giant elm trees which completely blocked streets and defied transportation, the fire which followed and threatened for a while to extend itself to the whole city, made the memory of it something akin to a nightmare. Water and even milk had to be boiled before using for several days after.

Officers and men at the Submarine Base were cut off from their families in New London through fallen trees between the Submarine Base and Groton, Conn., and the high water which prevented automobile transportation through an underpass into New London. As early evening came, the glow of fires, particularly the one in New London, illuminated large sections of the sky. It was fortunate in a way that the Power Company's lines were down and power was off because many short circuits would have resulted in fires in those buildings which had been damaged. However, when people reverted to kerosene lamps and candles for light, fires were bound to result.

People who had spent years in Florida and had experienced hurricanes there stated that they had never seen anything like the New London hurricane and the reason for that is evident. The hurricane in Florida wipes out all ramshackle buildings or turns over those palms or trees which have become weakened since the preceding hurricane a year or two previous. In New England the hurricane frequency period is about sixty

(*Continued on page* 22)

Modern Cathode Ray Equipment

By D. H. Seipt, '40 E.E.

ONE of radio's most recent developments, and now one of its most powerful tools, is the cathode ray tube. A great time saver, it is also invaluable in the field of qualitative measurements, and with its aid high frequency measurements hitherto difficult and impossible are easily made.

It is to be noted that this is spoken of as a development, rather than a discovery, for the principle of the cathode ray tube has been known to physicists for many years. The English scientist, Joseph J. Thompson, used it in his well known experiment to determine the ratio of the charge of an electron to its mass. Recent engineering developments have, however, turned this mere principle into a most useful and practical device.

The operation of the tube itself is fairly simple. Figure 1 is a sketch of a typical tube of the magnetic deflecting type. It consists, as shown, of an electron gun and focusing arrangement, a set of magnetic deflectors, and a flourescent screen which shows a brilliant spot of light where the electron beam strikes it. The electron gun itself consists simply of a hot cathode for producing free electrons, a control grid, and two or more high voltage anodes for accelerating these electrons. It may also include a focusing anode rather than the magnetic focusing arrangement shown. The collective result of these electrodes is to produce a beam of electrons or cathode ray which has negligible inertia and is therefore quickly and easily deflected by any magnetic or electrostatic field.

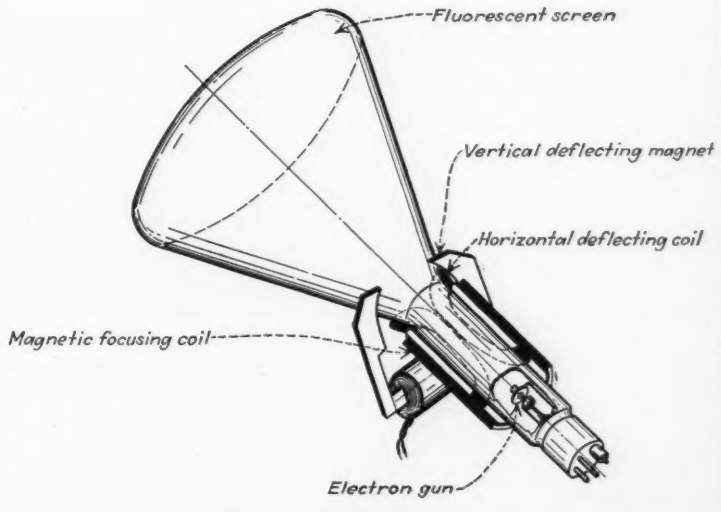
The tube sketched is of the magnetic type. In the electrostatic type two sets of small deflecting plates are placed inside the neck of the tube at right angles to each other. Voltages applied to these plates will set up an electrostatic field and will therefore deflect the ray in proportion to the applied voltage.

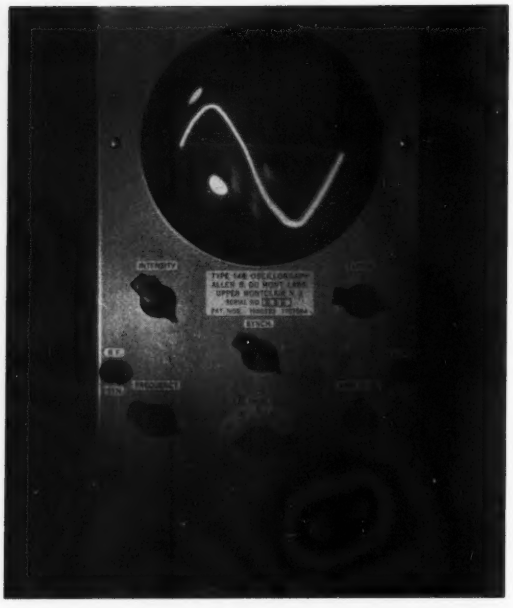
In the operation of the tube, a slowly increasing voltage, known as the time sweep voltage, is applied to the horizontal deflectors, causing the spot to move slowly across the screen. The voltage to be observed is then applied to the vertical deflectors. Since the time sweep voltage causes a constant speed horizontal motion of the spot, the resultant of both voltages is a wave form representing the fluctuations of the voltage in question with respect to time. In practice, the time sweep voltage is synchronized with the unknown voltage to produce a wave which constantly repeats its path, thus creating a stationary wave form on the screen.

The immense practical value of the oscilloscope now becomes apparent. Where before the engineer might spend hours taking data and plotting curves, he now has only to make a few connections and the oscilloscope presents the curves for him. In addition, the cathode ray has another distinct advantage: due to its practically inertialess properties, it can be used in alternating current measurements at such high frequencies as to make the use of ordinary equipment impossible. With the increasing development in high frequency radio work this becomes an important factor.

The use of the cathode ray tube has long been restricted to wealthy private laboratories, and to the research labortories of large manufacturing concerns. This has, in a large part, been caused by its expense, and by the lack of development of a rugged, reliable type of tube for general use. Recent advancements in the field of electronics, however, and in the development of the vacuum tube, have stimulated interest in the cathode ray tube. Within the past few years there

Figure 1.





Standard cathode ray oscilloscope with a simple sine wave on its screen.

have been placed on the market a number of different types for various purposes. Most of these are developments of the R.C.A. Manufacturing Co., although types made by several other companies are on the market. They are made in a variety of sizes, from those with screens of nine inches or more in diameter down to the small, metal-shelled type 913, with a screen only one inch in diameter. This tube, more than any other one, has been responsible for bringing good cathode ray equipment within reach of the average man's pocketbook.

A modern cathode ray oscilloscope includes the tube itself, its power supply, vacuum tube amplifiers for the voltages to be applied to the deflectors, and a vacuum tube oscillator for supplying the time sweep voltage. These all represent a number of technical difficulties which it was necessary to overcome before a successful oscilloscope could be marketed for general use. The various electrodes in the tube responsible for the stream of electrons require extremely high, purely D.C. voltages for proper operation. For example, the five-inch screen type 905 requires a potential of approximately 2,000 volts on the high voltage anode. Larger tubes require even more. This voltage must be uniform, (non-fluctuating) and therefore well filtered. Another difficulty occurred in the development of proper apparatus for producing the time sweep voltage. It is desirable that this voltage should increase uniformly (linearly with respect to time) to a maximum value, drop instantly to zero, and then repeat the cycle. Since this condition was not obtainable with ordinary vacuum tube oscillators, a special tube (type 885) was developed for this purpose. Special high voltage rectifier tubes were also developed to meet the stringent power supply requirements.

One of the features of the modern tube is the use of a screen of material which retains its brilliant phosphorescent glow for a comparatively long time, enabling photographs of the various phenomena to be easily made with the average camera and ordinary orthochromatic film.

As previously stated, the cathode ray tube, or, more specifically, the cathode ray oscilloscope, is applicable to a wide variety of use. In the classroom and in lecture demonstrations it is invaluable for illustrating the wave shapes of various complex alternating currents. The radio amateur finds it useful in checking the modulation and the various circuits of his modern radiotelephone transmitter. By making visible the wave shape of the audio-frequency voltages, it enables the tonal quality of any radio receiver to be readily analyzed, and defects to be easily determined. One of its most valuable uses is that of "lining up" the many complex, tuned circuits of a modern superheterodyne.

The most outstanding contribution of the cathode ray tube in recent years has been its utilization in the field of television. While its operation is too detailed to be explained here, it will suffice to say that this process is now accepted as a fundamental part of the practical television which we look for in the near future.

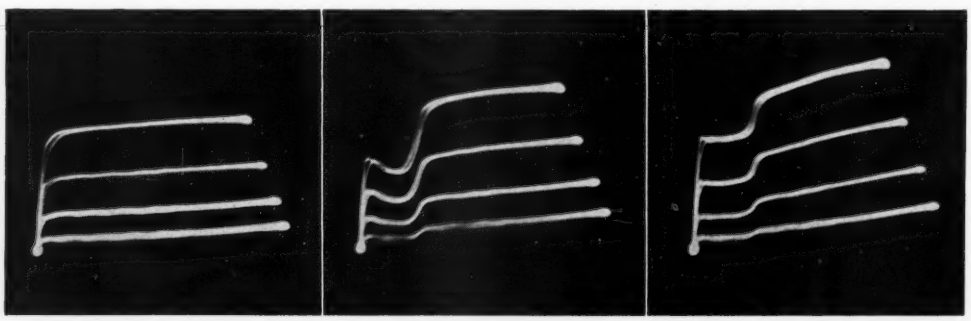


Plate characteristic of a type 6J7 tube as taken with the oscilloscope. The conditions for the three sets of curves are, left to right: Suppressor volts O, suppressor tied to screen, and suppressor tied to plate.

Treasure Island Comes To Life

By Ralph A. Tudor C.E. '25

Asst. Executive Officer, California Commissioner for the Golden Gate International Exposition

UNIQUE among all of the major expositions to date, the Golden Gate International Exposition on Treasure Island—in San Francisco Bay—presents engineering and architectural problems not heretofore encountered in a similar undertaking.

Every engineer and architect who has ever planned details of a world exposition probably has dreamed of a site similar to that on which The Pageant of the Pacific has been built.

This, then, is a brief summary of events leading up to an astonishing situation: No competitive architectural treatment nor lighting effects have to be considered on Treasure Island for the excellent reason that these competitive factors are nonexistent. The frame of the magical city now being rapidly completed is salt water of ocean blue.

Why?

Between 1932 and 1937 two of the world's greatest bridges were constructed between San Francisco and Oakland and between San Francisco and Marin County. The $77,000,000 San Francisco-Oakland Bay Bridge is easily the longest and costliest anywhere; and the $33,000,000 Golden Gate Bridge spans the harbor entrance with the greatest single span ever constructed.

Far longer than either of the foregoing is the picturesque "bridge" which the mammoth clipper ships of Pan American Airways swiftly cross on regular schedules to the Orient. They have changed weeks into days, speaking in terms of a voyage to Honolulu, Guam, Manila or Shanghai.

Some 40,000 miles of paved, first-class highways have been constructed in western America during recent years.

Huge water control and power projects—notably Boulder, Bonneville and Grand Coulee—have been completed or are well toward completion, the the benefit of industry and agriculture and the 11 Western States.

These briefly, form the background of the idea for a great international exposition in California in 1939.

Where?

In 1931 fourteen detailed surveys were made for a suitable airport site for the City of San Francisco. The unanimous choice of the experts retained was the Yerba Buena Shoals, just north of Yerba Buena Island, 4.7 miles to San Francisco's downtown district and 7.3 miles to Oakland's center of population.

Records prove that only 142 hours of fog have been encountered at the site annually for the past 45 years; that prevailing winds are gentle.

Hence, two important ideas were merged: a world's fair and a first-class airport. Each plan supplemented and complemented the other. In 1936 construction of Treasure Island was inaugurated.

How?

United States Army engineers, ammunitioned with nearly $4,000,000 in WPA funds, sponsored by an exposition corporation quickly formed, assembled first line dredges. Eleven of these big units—a fleet of nine at a given time—sucked black sand from the floor of the Bay and forced it through a network of pipe lines over Yerba Buena Shoals.

From a normal depth of 2 feet to 26 feet below water, a 400-acre man-made island steadily was built up to a height of 13 feet above sea level. Treasure Island is the largest island ever constructed by man.

Twenty million cubic yards of sand are enclosed with a sea wall over 17,000 feet in length, constructed of 287,000 tons of quarried rock. The Island is 5,520 feet in length, 3400 feet in width, and its 400 acres are connected with Yerba Buena Island by a broad highway 110 feet in width and 900 feet in length.

Directly connecting with the Bay Bridge between Oakland and San Francisco its six lanes present no left-hand turn problems and will speed vast traffic with ease.

But the Exposition will not depend solely upon this outstanding roadway for transportation. Four ferry slips are expected to care for a peak rate of 65,000 persons every hour. Three of the foregoing, on the San Francisco side, will discharge passengers at San Francisco's famous Ferry Building, while the fourth will disembark its human cargoes at Oakland.

How Much?

Popularly listed as a $50,000,000 enterprise, the Golden Gate International Exposition owes its financial being to several important sources:

1. The Federal Government provided something over $7,000,000 for the dredging operations, for construction of three important permanent airport build-

ings, for highway connections, water supplies, drainage, sewerage, landscaping and other improvements of a permanent nature.

2. Business men of the West contributed some $7,500,000 in subscriptions. The return of these funds to the contributors is contingent upon the Exposition's eventual surplus.

3. The Legislature of the State of California appropriated $5,000,000 for State participation. Administered by a commission of 25 prominent and responsible citizens headed by F. M. McAuliffe, Chairman, appointed by the Governor and serving without remuneration, these funds are being expended under the direct supervision of Charles H. Purcell, Executive Officer. As the builder of the San Francisco-Oakland Bay Bridge, State Highway Engineer for California, nationally and internationally prominent in engineering circles, Mr. Purcell should be too well known to the engineering fraternity of America to require any introduction.

4. Additional revenues, common to all expositions of note, include pre-opening receipts from rental of exhibit space and building sites; fees for concessions; advance ticket sales and numerous other sources of income.

5. The Federal government is expending $1,500,000 to tell the West Coast's great exposition the story of Federal participation and activities.

6. A lump estimate of investments by the various participating states, industrial exhibitors, foreign nations, concessionaires and others reaches the total of $20,000,000.

Pile Drivers and Hammers

Scarcely before the dredged sand was dry, active construction work on the three permanent buildings —administration and two huge hangars (to serve as exhibit halls during the Fair)—was well under way. The former cost $900,000 and is equipped with every facility for administration; the gigantic hangars — each 287 by 335 feet on the ground and 78 feet in height—are of steel and concrete, representing an investment of $450,000 each. For these buildings Exposition engineers applied a type of structure new to hangar construction: cantilevered walls, actually aiding, by their weight, in balancing the roof load.

All other buildings on the Island, obviously, are of temporary construction. After the termination of the Fair, all the latter structures will be demolished, to clear the runways for the Airport.

The main exhibit group comprises six great blocks of exhibit halls in general 200 feet wide by 400 to 900 feet long, radiating—spaced by broad courts—from a central Court of Honor.

The Treasure Island Skyline

Viewed from San Francisco's Embarcadero or any of the city's hills the dominating unit in the Exposition silhouette is the impressive Tower of the Sun, 400 feet in height, with a diameter of but 57 feet. It will house a carrillon of 44 bells.

Water Supply

A 10" pipeline across the Bay Bridge, designed to accommodate itself to bridge flexing, expansion and contraction, conveys San Francisco's water to a 3,000,000-gallon reservoir atop adjoining Yerba Buena Island. Gravity flow is thus provided for over 16 miles of Treasure Island's water mains.

A calculated average demand of 1,800,000 gallons of water daily for domestic consumption is provided for, with ample margin of safety.

Separate from the foregoing is a high-pressure fire system connection with a fire-boat manifold. The Fair's fire department of two platoons will have instantly available ample facilities for pumping from 5,000 to 10,000 gallons each minute through 10 to 20 hose lines. Automatic and protective circuits, connecting directly with the San Francisco fire department on the mainland, also, will make The Pageant of the Pacific as nearly fireproof and fire-safe as present day ingenuity may devise.

Other Utilities

Storm and sanitary sewerage systems are modern and adequate. Electrical installation is complete and all underground. Five miles of mains are provided for natural gas, brought to the Island through submarine conduits.

With facilities for comfortably parking 12,000 cars on the Island and a single bridge toll permitting either a round trip to the Island or a stop at the Exposition and continuance to the other side of the Bay—the auto traffic problems seem well in hand.

Architecture

The massive exhibit halls and palaces of the Exposition city—windowless for uniformity in display under the constant illumination — typify a new "Pacific" type of architectural styling, designed to exalt the visitor along lines of romance. Ancient mystical Oriental forms are blended in long horizontal lines, setback pyramids and masses characteristic of Malayan, Incan and Cambodian treatments, into a compact grouping of unified simplicity.

The elephant, huge beast of pageantry, is a predominating decorative note, crowning the pyramided entrance towers that flank the main portals. The universal employment of color, with smoothly flowing color symphonies, rather than harsh contrasts, will knit the Exposition buildings into an architectural unit of rare beauty. The official color palette includes 19 shades of a range to secure any effect desired.

Illumination

A "magic city" in amber, white and pastel shades of shimmering light, apparently floating in the waters of the harbor, is the entrancing picture that will be electrically painted by illumination engineers of the

Courtesy Roberts and Roberts

General view of Treasure Island and the San Francisco-Oakland Bay bridge. Yerba Buena island in the foreground. The six lane ramp leading from the bridge to the fair presents no left turns to the motorist.

Exposition, bulwarked with a budget of a million dollars. For the first time in history, a world's fair will enjoy the benefit of indirect lighting throughout, with not a single source of light visible to the eye.

More than 9,000 floodlights, including several types new to Exposition use, will assist in painting this picture. The Western World's Fair will burn an estimated 40,000,000 kilowatt hours of electricity during the 40 weeks of operation.

Landscaping

Since the Exposition is in California, it is natural that $1,500,000 should have been earmarked for horticultural display. Four hundred acres of sand have been transformed into a luxuriant garden. This is not an overstatement! 4,000 large trees; 70,000 shrubs; literally millions of flowering plants; wide expanses of verdant lawns; these thriving in a rich topsoil, atop the sand base, from which the harmful salts and other minerals have been effectually removed by an extensive leaching process.

Engineering Details

A book might be written and probably will be written, on details of engineering problems confronted and solved. In our own State Commission area of some 12 acres we have worked out some interesting phases. Space permits touching the highlights only:

(1) Due to the extensive use of wood, plywood on exteriors being extensively employed on a scale never before approached in exposition building, exceedingly rapid construction has been possible. Many major units have been erected in from 60 to 75 working days!

(2) Plywood and sheathing have been employed as major bracing elements.

(3) The use of large footings has kept the soil pressure down to 1,000 pounds per square foot for dead load.

(4) Large timbers, principally Douglas fir and California redwood—up to 14″ by 26″ have been frequently used.

(5) Underground pipes have been protected with asphaltum paint, to guard against the corrosive action of salt.

(*Continued on page* 24)

Do You Know These Men ?

JACK RALSTON BABSON '39 M.E.

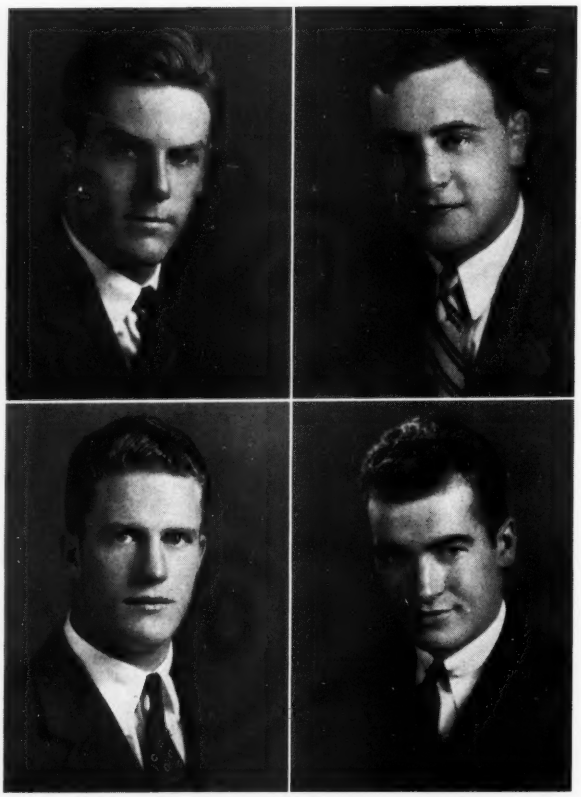
Although hindered by an attack of infantile paralysis just before entering Cornell as a freshman, Jack has lead a very athletic life at Cornell. He is captain of the hockey team, and he plays varsity lacrosse.

Also, "Red", as Jack is called at the Sigma Chi, is a modern Robin Hood. During his high school days he toured New York State with a group of talented archers giving exhibitions.

Swimming is another one of Jack's pleasures, and he also enjoys sailing. During vacation time he may sometimes be found sailing his "Snipe" on the waters of Oneida Lake, near his Syracuse home.

Besides athletics, Jack is very interested in social life, and spends a good share of his time participating in the social activities of his fraternity, Sigma Chi, and attending other social functions on the hill.

(*Continued on page* 15)



JOSEPH COORS
CH.E. '40

An inherent love for athletics is just a "natural" for Joe, who hails from within an hour's ride of the Continental Divide in Colorado, where the "best skiing in the world" is to be found. He has one objection here at Cornell with regard to athletics—and that is that he finds himself spending more time skiing than is most beneficial to his studies. His first three years of studies were spent in perfect harmony with the outdoor activities, but his fourth year of Chemical Engineering has put somewhat of a brake on the dual role which he has been playing.

For a number of years he has spent the first eight weeks of summer vacation at his father's chemical porcelain plant in Colorado, and the rest of the time at Nantucket, Massachusetts. The first summer at his father's plant was spent in nothing more than digging clay by hand and dynamiting to supply the porcelain plant with raw materials, with gradual easing off of

(*Continued on page* 15)

WALTER EDWARD GREGG, JR. '39 E.E.

How would you like to work within a few feet of a 134,000 volt power line, for only one day? Ned, as his fraternity brothers at Phi Gam have dubbed him, worked under such risky conditions, not for one day, but for three months two summers ago. He was employed, at that time, by the Pennsylvania Railroad to assist in building substations between Baltimore, Md. and Washington, D. C. Naturally, he was constantly dealing with high voltage equipment; and, according to Ned himself, such a dangerous atmosphere made him move about very carefully. Last summer, however, Gregg worked in a somewhat more congenial environment — this time wiring residential homes in and around Baltimore.

Athletics occupy Ned's main interest. He has not only been an outstanding member of the Cornell wrestling team, but is also

(*Continued on page* 15)

GENE L. HINTGEN
C.E. '39

Gene seems to have agreed whole - heartedly with the advice of the Engineering College: "spend at least one summer vacation in practical work in connection with your phase of engineering." His summer record includes work on an eighteen story building, taking road inventory, and constructing earthwork dams. Moreover, he has risen from the menial roll of day-laborer to the rank of construction foreman, surely an outstanding achievement for one not yet graduated from college. Last summer, Gene was active supervisor of a crew of C.C.C. laborers constructing earthwork dams; he completed four of them in North Dakota, to be used for flood control by the Forestry Division of the Soil Conservation Department.

Literature is one of Gene's interests. During his Junior Year, he took a course in Shakespeare. When Professor Adams saw his mark—an engineer receiving 85 in a course difficult for the best of English majors

(*Continued on page* 25)

PERSONALITIES

(*Continued from page* 14)

JACK RALSTON BABSON

Last summer Jack spent six weeks attending the ROTC camp at Aberdeen, Md., and throughout the past two years he has been a very active member of the ordnance division of the ROTC. The remainder of the summer he spent working in a steel plant in Chicago.

His plans following graduation are not as yet definite; he may possibly study further in the engineering world as a sales major.

Home address: Syracuse, N. Y.

Activities: Tau Beta Pi, Atmos, Captain of Hockey Team, Varsity Lacrosse Team, Red Key, Sphinx Head, Scabbard and Blade, Navy Day Ball Committee, Kappa Beta Phi, and Sigma Chi.

●

JOSEPH COORS

the manual labor in succeeding years.

However hard the work was, it was always done with pleasure and in anticipation of the remainder of the vacation, which was spent in the eastern portion of the United States. At Nantucket, Joe has found diversified pastimes, consisting for the most part of golfing, swimming, and plain and racing sailing at the Vineyard Sound Interclub, in small light cabin cruisers.

Joe is considered by some to be a bit radical in one certain view he holds; he objects to having a co-educational system in Eastern Universities.

Joe has still another year before graduation here, and as a result, is undecided as yet what his plans are after he receives his degree. He has the opportunity of entering his father's business in Colorado, but may accept an offer of a better position if it is to his liking.

Home Address: Golden, Colorado.

Activities: Tau Beta Pi, Phi Kappa Phi, Quill and Dagger, Red Key, Pres-elect A. I. CH. E., Navy Day Ball Committee, Freshman and Varsity Soccer, Golf, and Kappa Alpha.

●

WALTER EDWARD GREGG, JR.

university champion in his 135 pound class. Last spring he was elected captain of the varsity lacrosse team. Acting goalie of the team, Ned is looking forward to a highly successful season for the butterfly chasers this spring.

When we asked this well-built, stocky wrestler what he thought of his fellow engineers, he replied, "I feel that the people with whom I have come in contact while at Cornell are of a very high calibre, and I realize that my associations with them will be of great value in my future professional work."

After graduation Ned is hoping to enter the general engineering department of a large utility.

Home Address: Baltimore, Maryland.

Outside Activities: Varsity Wrestling Team 2, 3, 4; University Champion 2, 4; Lacrosse 3, 4 (Captain); Junior Advisory Committee; Interfraternity Football, Softball; Eta Kappa Nu; The Delta Club; Sphinx Head, Phi Gamma Delta.

FACULTY PERSONALITY

WILLIAM ABBOTT LEWIS, JR., B.S., M.S., Ph.D.
Director, School of Electrical Engineering

There recently arrived at Cornell a vigorous young man who looks forward to swatting tennis balls across the net as well as to assuming the duties and responsibilities of his position as a member of the faculty. Dr. Lewis is an ardent tennis player and has played for many years, winning his letter in tennis during his undergraduate days at college, and spending subsequent vacations at Ocean City and neighboring Lake Keuka playing tennis.

Although his mother once commented, "He ought to be a policeman because he looks well in blue," Dr. Lewis, upon graduating from high school, got a job with Westinghouse and spent two and one-half years tearing down motors and designing switchboards. Following this he took electrical engineering at California Institute of Technology, and while there he found time to do some debating and to take part in dramatics, playing in a Greek tragedy and a Roman comedy, as well as to play tennis.

A graduate of the California Institute of Technology, Lewis holds the B.S. with honor (1926), the M.S. with honor (1927), and is the only student of electrical engineering ever to receive from that institution the Ph.D. summa cum laude (1929). During his three years of graduate study at Cal Tech, he helped finance himself doing electrical work on the campus buildings. He laid out and designed the electrical equipment for the Guggenheim Laboratory at Cal Tech.

Entering the central station department of the Westinghouse Company in East Pittsburgh in 1929,

(*Continued on page* 27)

CORNELL SOCIETY of ENGINEERS

WALKER L. CISLER '22, President
80 Park Place, Newark, N. J.

WILLIS H. CARRIER '01, Vice President
Carrier Corporation, Syracuse, N. Y.

PAUL REYNEAU '13, Secretary and Treasurer
107 East 48th Street, New York, N. Y.

DAVID HARMON '31, Recording Secretary
21 Audubon Avenue, New York, N. Y.

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Column

Fellow Engineers:

I am glad to commend to you the following letter from George Brown, who is giving so much of his time in behalf of the Society. As I read his letter, the thought came to me that if each one of our present members would obtain a new member, what a great step would be taken in stimulating interest in these matters. If you will pass this issue of the CORNELL ENGINEER along to another Cornellian, I am sure much would be accomplished. The officers of the Society bespeak your help in furthering the work of the Membership Committee.

Very sincerely yours,
WALKER L. CISLER,
President

Letter from Membership Committee Chairman, George Brown, to Members:

Dear Fellow Engineers:

How much is Cornell worth to you? What does your past association with Cornell mean, now that you are faced with the daily routine of earning a living?

Has it ever occurred to you that to develop a present association with Cornell would not only keep you informed as to what was going on at Ithaca, but would pay handsome dividends in broader acquaintanceship and enlarged opportunities?

That is what the Cornell Society of Engineers is offering you for the small annual dues of $2.00. With the membership is included a year's subscription, eight issues, to the CORNELL ENGINEER, and for full measure, you can be assured that part of the $2.00 goes toward the support of the Cornell Employment Bureau which has done excellent work in helping Cornellians during the past few years.

GEORGE BROWN, '08

By joining now, you definitely ally yourself with an organization the purpose of which is to represent the engineering alumni body with the management and teaching staff of the engineering college at Ithaca.

Where can you get more for your money?

In the January issue of this magazine, you read Prof. John R. Bangs, Jr.'s letter on regional groups. His work ties in very closely with the work of the membership committee, for as the number of members in a given locality increases, there will be a greater demand for a local or regional group. With the formation of the group, more benefits will accrue to the members.

There are approximately 15,000 former students of the College of Engineering and the Society's membership is now 900, about 150 of which have been added this year. In greater New York, there are over 3500 engineering alumni and only 400 are to be found on our membership list. The Membership Committee feels that with consistent effort on their part, aided by any member interested enough to sell the idea to a friend, we should have 1000 members and more by June 1st.

To join, all you have to do is give us your name, address, class, and $2.00 and you will at once be placed on the mailing list for this magazine.

The following comprise the Membership Committee: L. M. Church '13, David Harmon '31, K. A. Reeve '28, E. W. Doebler '15, H. P. Muller '30, T. L. Smith '16, E. H. Day '19, T. D. Reimers '27, and L. S. Waterbury '19.

GEORGE N. BROWN '08, *Chairman*
55 Liberty Street
New York, N. Y.

FACULTY PERSONALITY

JOHN R. BANGS, JR., '21 M.E.
Head, Dept. of Administrative Engineering

Professor Bangs, better known to all of us as "Johnny," is one of those rarely found persons who can truly be called versatile. The average man would consider himself a success if he had been outstanding in one endeavor after a lifetime's work. Professor Bangs, however, in the short 25 years since he entered college, has received recognition as a successful scholar, athlete, track coach, practicing engineer, author, and educator.

Even in his undergraduate days, Professor Bangs showed his ability for doing several things well at the same time. His college years were a combination of studies, teaching, and athletics. At the age of 22, he entered the Mechanical Engineering school with advanced standing, well backed by varied engineering and business experience in Baltimore. At the end of his sophomore year, he went to Baltimore Polytechnic Institute, where he served two years as an instructor in electrical engineering and in steam engineering and design. He then returned to Cornell, and in two more years completed his studies for an ME degree, served as an instructor in machine design and in industrial engineering, and won fame as a weight thrower on the track team. His success in his undergraduate work can be easily perceived from the honors he attained, which include the Presidency of Tau Beta Pi and membership in Theta Alpha, Atmos, Sphinx Head, Phi Kappa Phi, Kappa Tau Chi, and Spiked Shoe.

"Johnny" has been an outstanding figure in Cornell track since he first entered the University, both as a star performer and a coach. For two years he won his "C" as a sprinter and weight thrower. He was an intercollegiate point scorer and set a South Atlantic record in the discus throw that stood for ten years. In his seventeen years of coaching, Professor Bangs has helped Coach Moakley turn out many winning track teams, and has himself coached such champions as Johnny Anderson and Duke Wood.

The guiding principle of Professor Bangs' work as an educator has been to train engineers in the subjects which will be of the greatest value to them in industry, and then to help them get positions where they can use that knowledge. With this in mind, he has been the energizing force behind the popular Administrative Engineering Department, of which he is now the head. In the rapid growth of this department since its inception seven years ago, Dean Dexter Kimball has guided Professor Bangs' successful efforts to develop a staff and curriculum which are respected pioneers in their field.

In 1928, Professor Bangs took over the personnel system of the College of Engineering. Under his leadership, the system was expanded considerably and established a fine record for the placement of graduates. It is now under the able direction of Assistant Professor John R. Moynihan.

Professor Bangs has obtained much practical experience upon which to base his courses while working as Personnel Adviser and Industrial Engineer for such prominent firms as the Gleason Works, Westinghouse Electric, Western Electric, and the New York Telephone Company. To his latest addition to the Administrative Engineering curriculum, the course "Human Nature in Management", Professor Bangs brings the experience he has gained in these and other activities. The popularity of the course with this year's Seniors is a good indication of its success.

At present, Professor Bangs is devoting much of his time to the Committee on Professional Status and Employment of Engineering Graduates, of which he is chairman, and to the Committee on Industrial Engineering for the Society for the Promotion of Engineering Education, of which he is a member.

Professor Bangs has written numerous articles and books on the management problems of industry, among which are "Industrial Accounting," "Cost Accounting Systems," and "Business and Industrial Management." In 1929 he was named a member of the Editorial and Consulting Staff of the Alexander Hamilton Institute.

That "Johnny's" interest in his students persists long after they have left the class rooms is clearly demonstrated by his interest in alumni activities. Just recently he was appointed Chairman of the Committee on Regional Organization of the Cornell Society of Engineers, which is working to establish local sections of the Society in the larger cities.

"Johnny" Bangs can truly be called an "all-round Cornellian." In the roles of student, athlete, coach, professor, and enthusiastic alumnus he has always promoted the best interests of Cornell with marked success. His deep understanding of young men and his desire to aid them in overcoming their difficulties, whether on the athletic field, in the class room, or out in the business world, has made him many close friends who will always be grateful for his helping hand.

NEWS OF THE ENGINEERING CAMPUS

In case you thought that Junior Week, with its highly successful Ice Carnival and bigger-than-ever Prom, was the only event of interest that has occurred about the campus since the last issue, let's look at the record and list a few of the highlights. As the smoke of registration clears away and the fear of bust notices lifts from the thresholds of the timid, we can plunge back to our serious pursuit of learning with assorted feelings of misgivings and elation.

As the Seniors enter the backstretch and the classrooms begin to look like fashion shows for the benefit of our visitors, the fact that this is the last term of the glorious eight seems to leave them just a little serious. If your house president seems to be softening up a bit and you find him dropping in for a quiet talk without his usual austerity, treat him gently, Frosh, for ere long you'll understand the reason when you contemplate your last fond Spring in Ithaca.

We find the Juniors breathing deeply after that first term of Mech Lab and anxiously feeling out the second term's prospects. "What's this I hear about an Automotive Report with 3385 pages and 640 curve sheets?"

The Sophs are beginning to feign sleep in eight o'clock lectures whether sleepy or not, just like they always do. "This 'Strength of Materials' can't be so tough, look at brother Jim of the Thamma Gams, he never studied much and he almost made a condition with a 48 last year."

Those looks of surprise, fervent thanks, and reassurance on the faces of many Frosh as they look at the thinned ranks about them, reflect the emotions of ones who just passed a real milestone—they are to be the cream of the country's engineering fraternity—well, most of them are.

For all of us—Term Two—this should go easier—we're hot and the study habit is well worn with no summer vacation to break the spell. And Ithaca in the Spring—just how do we get through the Fall anyway?

Before we leave King Winter behind, we want to congratulate two of our Senior A.E.'s on their work on the Junior Week Committee. Ned Wagner deserves a lot more credit than he took over the P.A. at his own Ice Carnival. Ned was chairman of the Ice Carnival Committee and when Miss Temperature came down but didn't stay, instead of frowning, he and his assistants performed a real engineering feat by transferring the whole show to Van Natta's Dam in a brief afternoon. This Carnival showed us how valuable a part of Junior Week the Ice Show is, and should give inspiration to future planners when they contemplate the risks of Ithaca's winter weather.

"Blackie" Blackburn engineered an effective promotion program as chairman of the Junior Week Publicity Committee, and we especially liked the competition for ice sculpturing instituted by the committee. To misquote that pseudo-Whalen, "Is it Dartmouth that claims to have a winter carnival?"

The engineers were also in the saddle on the Prom committee, where Chem E. Bob Pressing was chairman of the outfit. And when we remember that Mert Gerhauser was the hero of the Harvard Polo match with his post-bell goal to break a 12-12 tie, the week-end might just as well have been held in Sibley.

The campus has had several distinguished visitors in the last month, bringing their experience and information for the benefit of our seniors, the technical societies, and several of Johnny Bangs' lecture groups. Glancing over the list of demonstrations and speakers brings to mind how tantalizing it is to be living and studying right in the midst of so much that is interesting. Yet time limits us to our own field or technical society, and often those lectures are missed.

C. S. Coler, ME '11, returned to the campus Friday, January 27, to address senior mechanical and electrical engineers on "The Dynamics of Economy."

Since his graduation Coler has been affiliated with the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. He played a leading part in developing the educational department of the company, and is now principal of the Technical Night School for Westinghouse employes. He is also in charge of community relations.

Some years ago he used to visit the campus annually to interview seniors for employment, but no longer directs that branch of the company's program.

The case in favor of a "planning economy" for the United States was outlined to senior engineers Friday afternoon, January 6, by Professor Walter Rautenstrauch, executive officer of the Department of Industrial Engineering, Columbia University. "The 'planning economy,' with functions divided among separate departments, all under central direction, was the great discovery of individual industries in this country," he declared. "Why should not the same practice be applied to the national economy?"

He mentioned waste of soils, man-power, and machine power, the lack of adequate provision for social progress, the waste of preparations for war, and losses to personality and character as faults of the present business system.

The engineer must consider the social and economic applications of machinery; and he must approach the task of social invention as he has formerly approached mechanical invention. The engineer is adapted for this, because he has the habit of making careful observations and then discovering ways to make things workable.

How 3,300 tons of steel were fabricated and erected for the Trylon and Perisphere, which make up the theme center of the New York World's Fair, was described to an audience at Cornell, January 17, by Harold D. Hussey, designing engineer of the American Bridge Company. The Trylon, a three-sided pyramid 610 feet high, was a relatively easy problem, he said, but the Perishpere caused him to use spherical trigonometry "for the first time in 27 years."

Construction of the huge sphere, 180 feet in diameter, was especially difficult because the trusses at the bottom had to be heavier than at the top, to keep it from sagging. Hence the center of the interior was three feet above the center of the exterior. The general principle, however, was simple, adopted from a ten-cent tin globe. Thirty-two vertical trusses take the places of the lines of longitude, and 15 horizontal ones run around the sphere like lines of latitude. The surface has two layers, with insulation between, and is painted white.

J. H. Bigelow, thrift counselor to employees of the New York Telephone Company, addressed senior mechanical and electrical engineers on Friday, January 13, at 12 noon in Room 1 West Sibley on "Business Ethics."

Mr. H. L. Davis, former head of the New York Telephone Company's personnel department paid his second visit to Cornell this winter to hold a demonstration lecture for the seniors in Goldwin Smith auditorium on Friday, February 17. To illustrate some of the suggestions he made at his previous lecture he interviewed Jack Babson and Bob Gifford for hypothetical positions, on the platform, using a public address system to bring the discussion to the audience.

A. I. CHEM. E.

T. H. Chilton, director of the Chemical Engineering Research Laboratory of the du Pont Co., spoke on "Recent Developments in Chemical Engineering" in Baker Lecture Room on Wednesday, January 18. This talk was given under the auspices of the Student Chapter of the American Institute of Chemical Engineers. The lecture was accompanied by slides and motion pictures.

A.S.M.E.

At a meeting of the Student Branch of the American Society of Mechanical Engineers, January 24, Pelayo V. Riera gave a talk on the sulfite process of paper making.

Pelayo spent five days inspecting the Hammermill Bond Paper Company plant in which time he became well acquainted with the operations. His talk, and the movies which he used to illustrate it, covered the entire process from the felling of the tree to the final shipment of the product.

An election of officers for the coming year was held with the following results: Chairman, Beach Barrett; Vice-Chairman, Teh-Chang Koo; Secretary-Treasurer, John Billings.

The A.S.M.E. conducted an inspection trip to the Sayre yards of the Lehigh Valley Railroad on Saturday, February 18.

Newly elected officers of the A.S.M.E. (see above) left to right: Teh-Chang Koo, Beach Barrett and John Billings. Forgive us for mentioning that the last two are staffmen on the CORNELL ENGINEER.

This atomic Gun shoots ionized atoms at a target with tremendous accelerations.

NEW ATOM SMASHER

The first major scientific development originating from a university laboratory this current year was announced recently by the Department of Physics in the form of an "atomic gun", designed and built by Professor Lloyd P. Smith, Ph.D. '30, assisted by Dr. Paul L. Hartman, Ph.D. '38. The new apparatus represents more than three years' work and a cost of more than $7000.

The "linear resonant accelerator", as it is called by its designer, consists of a "barrel", a glass vacuum tube, eight feet in length and six inches in diameter, within which eight metal tubes fastened end to end are connected with a short wave generator capable of alternating their potential ten million times per second. The atoms to be studied are placed in the "breech" in the form of gas or vapor, where they are charged positively. The metal tube at the breech is negatively charged, drawing the ionized particles into it.

Then the succession of tubes inside the glass "barrel" are progressively charged, reversing their positive and negative ends, thus drawing forward at tremendous acceleration the ionized atoms toward the "target" at the forward end. Thus, in short, short wave radio power is used to hurl atoms to be studied at terrific speed at other atoms in order to disintegrate their nuclei. This "atomic gun" differs from the cyclotron in that it accelerates its projectiles in a straight line instead of in a circular motion. It is hoped that studies of the resulting atomic explosions will throw some further light on the nature of the enormous forces which hold together the nuclear constituents of atoms.

This machine has a particular value in certain investigations as it is capable of selecting from the vapors in the "breech" atoms of any desired weight, and of shooting only them at the target. It also makes possible a higher concentration of atomic "bullets" than other methods; it is safe from danger of electric shock to its operators; and it is less costly than most types of atom smashers. Higher energies may be developed by making the "barrel" of the gun longer.

PHILCO MYSTERY CONTROL

Rolfe S. Blodget, factory engineer of the Philco Radio Company, addressed the Cornell student branch of the American Institute of Electrical Engineers Thursday, January 19. His talk on "The Philco Mystery Control" was given in Franklin Hall auditorium.

(*Continued on page* 26)

Alumni News

High officials of Cornell University, including President Edmund E. Day, Provost H. Wallace Peters, Trustee Bancroft Gherardi, and Dean S. C. Hollister of the College of Engineering, addressed members of the Cornell Club of Western Pennsylvania at their annual banquet Monday, Jan. 30. The affair was held at the University Club in Pittsburgh.

The general topic for discussion was the University's program for development of the resources of the College of Engineering. A statement of immediate needs, including endowment for faculty salaries and construction and equipping of new buildings for the School of Chemical Engineering and a Materials and Metallurgy Laboratory, was issued by President Day two months ago, and a special committee, of which Mr. Gherardi, retired vice president and chief engineer of the American Telephone and Telegraph Company, is chairman, has undertaken to raise $6,000,000 for the project.

●

ALEXANDER GRAHAM CHRISTIE, ME '05, instructor at the College of Engineering, from 1905-1907, and now professor of mechanical engineering at Johns Hopkins University, was elected president of the American Society of Mechanical Engineers at the recent national convention.

His statement of the aims and future of the ASME appears as an editorial in the January issue of the Mechanical Engineer, national publication of the Society.

●

PROFESSOR F. G. SWITZER, ME '13, MME '14, of the College of Engineering, has been named vice chairman of the Hydraulics Division of the American Society of Mechanical Engineers for the current year. He has been secretary of the division since 1935 and a member of the executive committee since 1937. He has also been named to the committee on centrifugal and rotary pumps, a subdivision of the society's Power Test Codes Technical Committee.

●

JOHN CARLTON WARD, ME '14, has been elected vice president and director of the United Aircraft Corporation and general manager of the Pratt and Whitney Aircraft Division.

Ward has devoted a major part of his professional career to the building of precision machines, typical of those used in the construction of the modern aircraft engine, and to the building of the engines themselves. Before his recent appointment he was assistant general manager of Pratt and Whitney Aircraft Corporation.

●

THOMAS MIDGLEY, JR., ME '11, is one of five executives of the Ethyl Gasoline Corporation who have been awarded emblems in recognition of fifteen years of service. The Ethyl Gasoline Corporation was founded in 1924 to manufacture and distribute Ethyl Fluid, discovered by Midgley, who is now vice president of the corporation. He was recently reelected to the board of the American Chemical Society. His son, Thomas Midgley, III, is now a senior in the College of Engineering, Cornell University.

ALBERT R. HODGES, EE '32, AB '30, is a patent engineer, associated with Ralph H. Langley, consulting engineer, with offices at 165 Broadway, New York City. His home is at 183 Union Street, Ridgewood, N. J. He writes, "I recently became a registered patent attorney after successfully passing the required six-hour examination which is prescribed by the United States Patent Office. We specialize in radio and electronic patent matters, approaching patents with an engineering viewpoint (the usual approach emphasizes the legal aspects)."

●

EUGENE TU and YUNG NIEN TSOK, MCE '35, PHD '38, MS '38, have returned to China to aid in rehabilitation. They expect to work on the railroad building projects now being carried on in South China. Tu specializes in bridge construction.

●

BENJAMIN K. BOYCE, ME '07, CE '23, chief engineer of the upstate area of the New York Telephone Company since 1926, is now chief engineer in the Manhattan district. Austin L. Rumsey '23 succeeds him as chief engineer of the upstate area. He has been supervisor and district plant superintendent at Poughkeepsie and Buffalo.

●

DR. ROLAND P. DAVIS, MCE '08, PHD '14, has been elected president of the West Virginia Society of Professional Engineers. He has been Dean of the College of Engineering, University of West Virginia, since 1932, and was formerly professor of structural and hydraulic engineering. He was an instructor in Civil Engineering at Cornell from 1908 to 1911. He has also been connected with the American Bridge Company and was for some time bridge engineer and consulting bridge engineer of the State Road Commission of West Virginia.

●

WILLIAM G. CHRISTY, ME '11, as smoke abatement engineer of Hudson County, N. J., is in charge of the only county smoke abatement department in the United States. His office is in the Court House, Jersey City, N. J., and he lives at 1 Kingwood Road, Weehawken, N. J. He is a member of the executive committee of the fuels division of the American Society of Mechanical Engineers and vice president of the Hudson County chapter of the Professional Engineers Association of New Jersey.

●

ARTHUR E. STANAT, EE '28, has been appointed teacher of related technical subjects in the new Technical High School at Binghamton, N. Y. From 1929 to 1938 he was with the Elliott Company, Ridgway, Pa., as student apprentice, junior engineer, sales manager, and finally manager of the service department.

This year he has been taking special work at Cornell under Professor Lynn A. Emerson in preparation for teaching in the general field of industrial education.

●

THOMAS W. FRANK, AE-ME '38, was married to Miss Claire Weil on January 25th in Pittsburgh. Mrs. Frank is a graduate of the University of Pittsburgh.

Tom is now working for the Timken Roller Bearing Company in Canton, Ohio.

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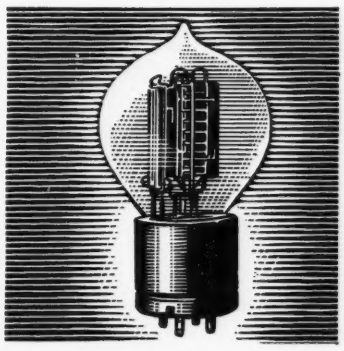
WILLARD STRAIGHT HALL **H. H. WILLIAMS, '25, Director**

RIGHT OR WRONG?

A 2-minute test for telephone users

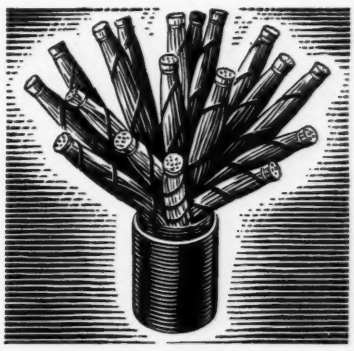
1. The Bell System handles about 48,000 telephone calls per minute, on the average.

RIGHT ☐ **WRONG** ☐



2. One of the first uses of vacuum tubes was in telephony—years before commercial radio telephony.

RIGHT ☐ **WRONG** ☐



3. The largest telephone cable used by the Bell System contains 2424 wires.

RIGHT ☐ **WRONG** ☐

4. The Bell System employs about as many people as live in the city of Dayton, Ohio.

RIGHT ☐ **WRONG** ☐

5. This is part of a page taken from a telephone directory published in the United States.

RIGHT ☐ **WRONG** ☐

6. Lowest rates to most out-of-town points are available every night after 7 P.M. and all day Sunday.

RIGHT ☐ **WRONG** ☐

ANSWERS

1. *Right.* In 1938 the average number of calls per day was about 70 million.

2. *Right.* The repeater tube, which makes possible long distance telephony, was first used in 1913.

3. *Wrong.* 3636 wires are packed into a cable about the size of a man's wrist.

4. *Wrong.* The population of Dayton is about 200,000 — while there are nearly 300,000 telephone employees.

5. *Right.* It is from San Francisco's Chinatown telephone directory.

6. *Right.* Why not telephone family and distant friends oftener?

AMERICAN TELEPHONE & TELEGRAPH CO. AND ASSOCIATED COMPANIES — BELL SYSTEM

BELL TELEPHONE SYSTEM

DEATH RAYS

(*Continued from page* 6)

were killed in 1.2 seconds of exposure.

Forty-six states today have stringent laws on their books requiring the sterilization of eating and drinking utensils, but the laws have not been enforced because it was recognized by the authorities that until recently no practical method of sterilization was known. Nothing less than live steam is sufficient, and this is not only expensive because of initial cost and cost due to breakage of glassware and dishes, but also is impractical for a small drug store in the summertime. Since the development of the Rentschler-James process several drug stores have made installations, all of which have been occasioned by remarkable results.

One of the most important applications of the new system has been in the surgical operating rooms of hospitals. Lamps installed at Duke Hospital by Surgeon-in-Chief Dr. Deryl K. Hart were met with instant approval. Beneath the level around the patient, the supply table, and instrument table virtually all the the bacteria were killed, while even in the far corners of the room about 80% to 90% were eliminated. Operating room infections dropped almost to the disappearing point. Postoperative temperature curves of patients have been considerably lowered. Since Dr. Hart's experiments, many other hospitals have installed "Sterilamps."

The ability of the lamp to kill bacteria and molds led to its installation in meat storage refrigerators, where many advantages were noted: low temperature storage becomes unnecessary, thus eliminating previously necessary equipment, and cutting operating and maintenance costs 25%; reduction of dehydration loss from six to one per cent of meat purchases; reduction of trimming losses from ten per cent to less than five per cent; improved appearance of meat; improved odor of meat and refrigerator; and elimination of the necessity of artificial freshening of meat. The same beneficial effects were noted when the lamps were installed in display cases.

In the preparation of farm products, not only the sterilization of the product and container, but also the sterilization of the air itself is necessary. The solution of the problem of eliminating air-borne bacteria that fall into the milking pail before raw milk can be bottled, was found in the use of the new lamp, as several experiments have proved. Today, in addition to regular use of the lamps in the cow barns, they are in use in hen-houses, brooderhouses, and hogpens.

The losses from mold spoilage in baked goods have been reduced by providing a sterile atmosphere in which to cool the freshly baked cakes and loaves of bread.

The field of air sterilization covers all applications from homes to offices, schools, restaurants, soda fountains, and other public places. It has been proved a most effective barrier between pathogenic and non-pathogenic bacteria and the potential recipient. It assists in the reduction of infection in hospital rooms and reduces considerably a possibility of epidemic in cow barns and hen houses.

Credit and honor are due to Drs. Rentschler and James for the development of this lamp, so beneficial to the health of mankind, and possessing so many practical uses. It is typical of the fruits borne by organizations employing scientific research laboratories and policies, and is an example of the benefits which accrue to the general public as a result of these policies.

•

HURRICANE

(*Continued from page* 8)

times as long and presumably can accomplish that much more physical damage when one does strike. However, the only other record of a hurricane turning into the northwest after proceeding up the Atlantic Coast instead of turning to the northeast and expending its fury on the ocean indicates that a similar occurrence took place 123 years before, in the year 1815. Some author wrote a book describing the high water and winds of hurricane force in that year. The water appeared to be higher in the 1938 hurricane than in the 1815 storm, which incidentally occurred on September 23rd, or two days later than in 1938.

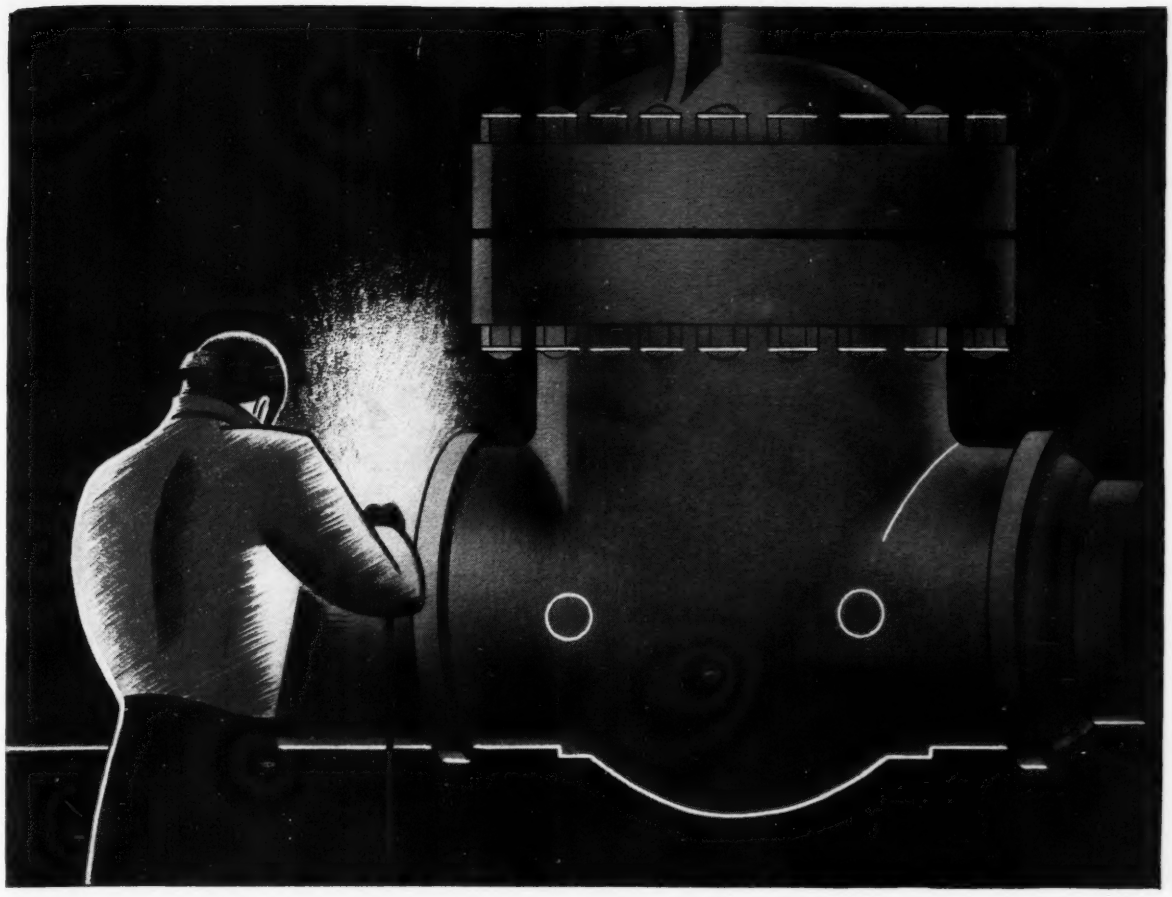
An account of the 1815 hurricane stated that according to Indian tradition, a similar storm occurred about 200 years previously when a considerable number of the Indians perished.

It should be noted that a check of the fallen trees appeared to bring a maximum age of approximately 120 years when the annual rings were counted, which figure corresponds with the year 1815 when trees were previously destroyed.

Hundreds of men were needed for traffic direction and National Guardsmen and Boy Scouts performed this duty. Enlisted men of the Army, Navy, and Coast Guard also helped the city. One odd incident occasioned some comment. Practically all the ugly looking billboard signs were destroyed but despite the shortage of labor for repairing houses, power lines and telephone communications, etc., these least essential items were re-erected with remarkable speed.

One of the freak occurrences of the storm concerned a man who had a house along the beach on leased property at Bushy Point on the Poquonnock River. He planned at the expiration of the lease to move the house by water across the river to a site that he owned in Poquonnock, a section of Groton. This site was approximately two miles distant by water. When the storm tide had abated, the house was within twenty feet of the new location and it had been floated across

(*Continued on page* 27)



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What is more, Carbon-Molybdenum steel not only meets the physical requirements exactly but also comes within the cost limitations that usually exist.

We will gladly send our booklet, "Molybdenum in Steel", containing a great deal of practical data, free to technical students and others interested in improved materials giving more per alloy dollar.

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TREASURE ISLAND

(*Continued from page* 13)

The above list is far from complete. The features set down are but typical of a host of similar ones encountered—and successfully surmounted with patience and constant study.

Distinctive Features

The 1939 Treasure Island Exposition will incorporate features original in Exposition planning. Progress and the site enter into these unique attractions. Again, briefly:

(1) Pacific Basin Area: A chain of colorful lagoons, with the nations of the Pacific, housed in buildings of typical native architecture, clustered around them. Every aspect of the various countries will be graphically and realistically portrayed.

(2) China Clipper base: Pan American Airways will set up a complete Trans-Pacific base on Treasure Island, before the Fair opens. Clipper ships will arrive and depart from the adjacent Treasure Cove, a sheltered lagoon. All operations of maintenance and terminal servicing and facilities will be visible to visitors.

(3) Temple of Religion: A $100,000 structure with a stately and impressive Tower of Peace, where creeds will join in presenting religious displays throughout the duration of the Fair.

(4) The Kayway: "Forty Acres of Fun" with an exotic, international flavor, from Japanese dancing girls to the dizziest of mechanical rides.

(5) Treasure Mountain: A huge model mountain 38 feet high and 150 feet long, with practical working demonstrations of every type of Western mining. Within the space of a few minutes and by walking but a comparatively short distance the visitor may gain a comprehensive idea of the whys and hows of metal mining and metal uses.

(6) Industrial West: A gigantic relief map of the 11 Western States. Over 11,000 square feet in area, natural resources, dams, transmission lines, rail and highway arteries and more will be shown in precise detail.

This list might be extended greatly.

Governmental Participation

Designated as America's official World's Fair of the West, the Golden Gate International Exposition enjoys generous participation by our own Federal government; active representation by more than 30 other nations; all of the 11 Western States—and more. Many nations will exhibit in their own buildings; others will avail themselves of the facilities of spacious halls and palaces.

Industrial Participation

More than 250 outstanding American industries

have reserved exhibit space on Treasure Island. The complete roster reads like the Blue Book of American business.

Everywhere exhibitors are aiming at, and achieving, constant motion in their displays. The Pageant of the Pacific will accentuate the dynamic but soft-pedal the static. High-class showmanship is apparent in all planned displays.

SPECIAL EVENTS

Highlighted against the background of governmental and industrial pageantry on the Island will be an imposing calendar of special events numbering over 3,000 at this writing. During the 288 days of the Fair the finest talent in music, the drama, the world of athletics and sports, and other fields of endeavor will be available for distinctive performances.

RESUME

Having had the pleasure of being associated with Mr. Purcell on the engineering and construction of the San Francisco-Oakland Bay Bridge, the thought occurs that our work there had to do with a very exact science. In contradistinction, the building of an important unit in a great exposition is a very inexact science—with the picture of necessity changing daily, new and unforeseen problems constantly arising —consequently with many indeterminate factors.

The opening date was February 18 at ten in the morning and the gates will remain open until December 2, 1939. Twenty million visitors—even more, according to recent national surveys—are expected. The engineering fraternity is cordially invited to lay aside slide rules, logarithms and theorems; to dismiss Newton and Euclid for the time being; to join with the Eleven Western States in the most beautiful and interesting Exposition of all time!

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PERSONALITIES

(*Continued from page* 14)

—he called Hintgen into his office and remarked to him, "Amazing, truly amazing!"

Gene has a particular leaning toward structural engineering. The practical experience and the accomplishments of this quick, wiry fellow foretells success in his chosen field.

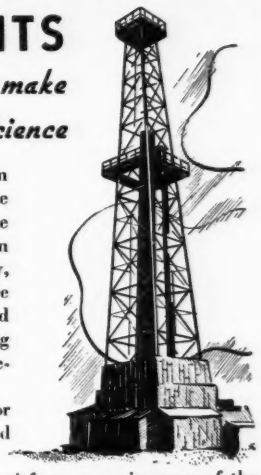
Gene's interest in the printed word has also extended into his campus activities. He was elected to the Cornellian Editorial Board at the end of his freshman year, and has held the positions of Assistant Managing Editor and Managing Editor in his junior and senior years. He was elected to Chi Epsilon in the fall of his junior year and to Tau Beta Pi in the following spring, both outstanding honors.

Home Address: Bismarck, North Dakota.

Activities: Managing Editor of the 1939 Cornellian, Chi Epsilon, Tau Beta Pi (elected at the end of his Junior year), Treasurer of Kappa Beta Phi, Treasurer of his fraternity, Delta Tau Delta, Recipient of a Regional McMullen Scholarship.

CAMBRIDGE GEOPHYSICAL INSTRUMENTS

. . . have helped to make Oil Prospecting a Science



Cambridge has, for the past ten years, constructed recorders for use in geophysical prospecting by the seismic method for both refraction and reflection shooting. Accordingly, recorders of extreme sensitivity are available for refraction work and multi-record equipments providing as many as twelve channels for reflection work.

Standard designs are available or modifications will be incorporated when desired.

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•

Life Insurance is one of the Outstanding Investments which, as the years pass by, Advances in Value

During the past 38 years over 1000 thrifty students graduating from the Engineering Department of Cornell University have created estates in excess of $5,000,000 by buying life insurance and annuity policies from the

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For further information regarding a guaranteed life income beginning at age of 60 or 65,

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COLLEGE NEWS

(*Continued from page* 19)

PROFESSOR EMERITUS OGDEN

The Board of Trustees of Cornell University, at their January meeting, placed on record a testimonial to Professor Emeritus Henry Neely Ogden of the School of Civil Engineering, prepared by his colleagues following his retirement last June from active teaching. The statement is called an "acknowledgement of the long and faithful service which he has rendered to Cornell University."

It continues: "Entering as a student in 1885 when Cornell University had been in existence but eighteen years, the experience of Professor Ogden runs through a long and important period in the development of the University, and of the College and School of Civil Engineering. This period covers the four years of his student life and forty-seven years of teaching activity. Like many of the early members of the staff of instruction, he was called upon to teach courses covering all of the subjects of the curriculum except those included in the department of structural engineering. Such courses were drawing, descriptive geometry, surveying, mechanics, hydraulics, geodesy, stereotomy, and the masonry arch, as well as the topics of his chosen field of sanitary engineering.

"Fortunately possessed of a strong physique, urged on by a keen and energetic mind, tireless in his attention to assigned tasks, during the many years of his teaching experience he brought to his students thoroughly prepared instruction. Graduates in Civil Engineering in suecessive classes attest to his clear, logical and eloquent presentation of the day's assignment and have profited by stimulated interest in the subjects of his courses.

"As an author (and co-author) during the years from 1898 to 1913 Professor Ogden evidenced his capacity for concentrated effort and for fruitful scholarship by the publication of four books dealing with Sewer Design, Sewer Construction, Rural Hygiene, and Sewage Disposal for Rural Homes. The first two of these volumes were used as textbooks in their fields for some years.

"Professor Ogden is a member of the American Society of Civil Engineers, the American Public Health Association, the Royal Sanitary Institute of Great Britain, and Sigma Xi.

"With his retirement from the arduous and exacting duties of the class room, duties which he nevertheless enthusiastically performed and now regretfully relinquishes, we, his colleagues, look forward to a period of continuing scholarly activity and wish him well."

CHARLES LEE CRANDALL PRIZES

Opening of the annual competition for the Charles Lee Crandall Prizes of $75, $50, $35, and $20 has been announced by Director W. L. Malcolm of the School of Civil Engineering. The prizes are offered annually to juniors and seniors in the school for papers showing merit both in substance and in written form.

The fund was established in 1916 by alumni of the School of Civil Engineering to "encourage original research, to stimulate interest in matters of public concern, and to inspire in the students an appreciation of the opportunities which the profession of civil engineering offers them to serve their fellowmen as intelligent and public-spirited citizens." Papers must be submitted on or before May 1.

(*Continued on page* 28)

DIRECTOR W. A. LEWIS

(*Continued from page* 15)

Dr. Lewis rapidly became an authority on technical electrical problems, particularly those concerned with interconnection, stability, and high-voltage transmission. He invented speed relays for power system protection and has assisted in designing substations and protective equipment for the electrification of the Reading Railroad.

Although Dr. Lewis has spent 16 years in California, he agrees that it is possible to live elsewhere, and in fact his wife, also a onetime Californian, prefers to live in the east; she has never liked California! They have one five and one-half year old son who has tendencies toward being the boss of the family.

During the past seven years, Dr. Lewis has been associated with the cooperative program which is being carried on for graduate engineers between Westinghouse and the University of Pittsburgh. He brings a structural background of work in electrical engineering education to his position at Cornell.

Formerly an engineer with the Westinghouse Electric and Manufacturing Company, in Pittsburgh, Pa., and a Westinghouse lecturer in electrical engineering at the University of Pittsburgh, his appointment was approved by the Board of Trustees on his thirty-fifth birthday, making him one of the youngest men ever selected for high administrative office at Cornell.

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HURRICANE

(*Continued from page* 22)

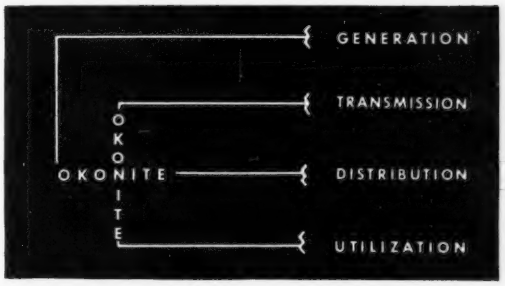
so gently that glasses on the dining room table were still in their original position. That is a "believe it or not" that is hard to believe.

Many amusing incidents were also related. In restoring electric service the main lines were hooked up first and if the line leading to one's home happened to be intact and not carried away by a fallen tree, one was fortunate to have the current on after being without it for one or two weeks. In one section, a power company official happened to lose his lead-in line, so he was without light or heat (electrically operated oil burner). It was necessary for this man to ask one of his more fortunate neighbors for permission to take a warm bath.

Another incident concerns two sailors walking to town and being directed across streets under Boy Scout supervision. The one lad observed to his buddy, "I've been in this outfit for a number of years and I've taken orders from many different people, but this is the first time I've been ordered around by a Boy Scout."

One of the hardware merchants in town who had his windows blown out, his roof completely removed with considerable portions of the brickwork which comprised the third story, thus leaving his stock exposed to the heavens, quickly painted some signs on cardboard and tacked them to the woodwork which was thrown in the place where the windows had been. The signs read "Open for Business" and truly he was.

THE 4-ø ELECTRICAL SYSTEM



Okonite Wires and Cables are designed for every condition of use in each of these phases of any electrical system.

A 220,000-volt transmission cable or the smallest control wire may be the vital link in the chain, and seven laboratories in the Okonite factories provide the testing facilities that insure equivalent strength in each link.

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COLLEGE NEWS

(*Continued from page 26*)

A.I.E.E.

Eight members of the faculty of the School of Electrical Engineering took part in the national convention of the American Institute of Electrical Engineers January 23-27 in New York City. They included Former Director Paul M. Lincoln and Professors W. C. Ballard, Jr., R. F. Chamberlain, L. A. Burckmyer, Jr., E. M. Strong, True McLean, M. G. Malti, and Mr. W. W. Cotner.

Professor Lincoln delivered a paper on "Demand Meter Time Periods." Professor Ballard gave one of a series of papers at a conference on the general subject of the teaching of communication engineering and electronics. Professor Chamberlain attended a meeting of the national committee on industrial power applications. Professor Strong attended meetings of committees on education and illumination. Professor Malti conducted a conference on electrical definitions.

Mr. Cotner and Professor McLean, as chairman and secretary, respectively, of the Ithaca Section of the society, acted as representatives of this area in a general business meeting.

Professor A. C. Davis of the College of Engineering, Cornell University, has been elected to the board of directors of the Central New York Chapter of the American Foundrymen's Association, organized on February 10 at a meeting in Syracuse. This is the sixteenth A.F.A. chapter chartered in the United States.

Interest in the organization has been fostered in this region by two foundrymen's conferences at Cornell, in 1937 and 1938, the first ever held in this state. Professor Davis has been active in the association for many years and was largely instrumental in arranging the Cornell conferences.

Professor John R. Bangs, Jr. (see page 17) has been appointed a member of the executive committee of the Management Division of the A.S.M.E. As chairman of a sub-committee on marketing and distribution, he will be responsible for arranging the program of papers in this field to be presented at the next annual convention, which will be held in Philadelphia.

Our two most recent visitors from afield were Tell Berna '12 manager of the National Machine Tool Builders Association, and Allan H. Morgensen '24 M.E., "Work Simplification" consultant and consulting editor of "Factory."

Mr. Berna spoke to the Seniors on Friday, February 24th with suggestions for graduating engineers founded on his wide experience in the field of machine tool. Contending that he takes exception to the attitude that our elders have made a mess of the economic order and that it is up to the new generation to suddenly become the Spartan saviors of the world, he went on to explain that the problems of unemployment, poverty, slum housing, and religious and political intolerance are ageless, and should be attacked by such trained minds as engineers should possess, in a rational way.

Mr. Mogensen brought films to illustrate how the study of work simplification can save time and fatigue for the worker all in one. He stressed the importance of treating this study as a human problem, which requires more consideration than mere empirical formulas of time and motion study.

We hope to print papers from both of these men in future issues of the CORNELL ENGINEER.

STRESS AND STRAIN

HOW TO WRITE A MECH LAB REPORT

Guarantee: We, the author of this learned discourse, guarantee that if you pay any tension to our suggestions you will compression near to busting the course.

1. Having waited until the night before the report is due, collect half a dozen of your pencils from the desks of your fraternity brothers, and sharpen them all carefully.
2. Clear off your desk. Hunt up a piece of graph paper and place it in the geometric center of said desk. Sit and stare at paper intensely.
3. Join bull session in next room.
4. Leave bull session in disgust, and get down to work in earnest. Dig up seven old reports from files.
5. Discover you have neglected to obtain important data, and spend half an hour on the phone trying to find someone in your section.
6. Finally get hold of Joe Blitz, who gives you the data, and suggests forgetting your troubles by joining him on a binge to Elmira. Refuse indignantly.
7. Chew ends off three pencils. Draw on paper inspired sketch of Blonde, with impossible eyelashes and too much hair. Graph is now spoiled so fold it into paper airplane and make test flights across the room.
8. Get out data sheet and study it until you discover it is upside down. Reverse sheet. Multiply the first column of figures by pi, take the square root and extract the log to the base 13, to see if you can get reasonable values for the second column.
10. Find your results have an error of 948% when compared to the old reports.
11. Phone Joe Blitz and tell him you've changed your mind.

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And then there was the Phi Beta Kappa who took notes on the Commencement address.

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Lives of students all remind us
We should always do our best
And, departing, leave behind us
Notebooks that will help the rest.
Notebooks that, perhaps another—
Stumbling on our tracks to fame—
Some forlorn and flunked out brother,
Using, shall flunk out again.

●

A worried looking man entered the spooky atmosphere of the fortune teller's establishment.

"Do you guarantee that I can talk with my dead wife?"

"Absolutely," the seer promised.

"Then ask her where in heaven's name she put my golf pants."

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G-E Campus News

NEW–TYPE STREAMLINER

A NEW-TYPE 125-mile-an-hour streamliner — the 5000 horsepower steam-electric train now being put through its final tests by G-E engineers—soon will be speeding on its first westward run over the Union Pacific's historic "Overland Route."

Nearly two years have been spent by General Electric and Union Pacific engineers in designing and building the streamliner. The result is that the power plant of the new train is capable of doing twice the work of a conventional steam locomotive for each pound of fuel used, and of making three times the mileage without stopping for fuel or water. Six large motors in each of the two cabs drive the locomotive, the electricity being supplied by a geared turbine-electric generating unit similar to those used on many ships.

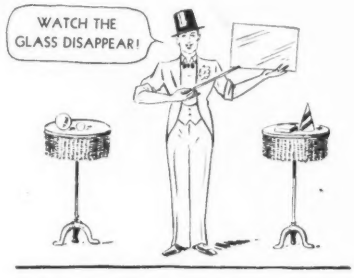
As the new 15-car streamliner speeds between Chicago and the Pacific Coast, at times winding through passes more than 7000 feet above sea level, it will be another symbol of the constant search by General Electric's transportation engineers for more efficient means of travel. This search is one in which the engineer with years of experience gives invaluable training to the Test men—young student engineers recently graduated from college—who assist him.

TELEVISION AT THE NEW YORK WORLD'S FAIR

IF YOU have a favorite line or two from Kipling or a famous Shakespearean speech you like to give now and then, consider the *ne plus ultra* of settings for the presentation—a complete television studio, with an audience as standard equipment, recently announced by Dr. W. R. G. Baker, Union '16, managing engineer of the General Electric radio division and an ex-Test man.

For you are invited to turn actor in the G-E building at "The World of Tomorrow," the New York World's Fair. At your service will be a program director, who will initiate you into the experience of acting before the camera, and complete television equipment of the latest design—receivers, camera, transmitter. And between acts you will be able to see and listen to programs that are being broadcast by television stations throughout the New York area.

Demonstrating television to the public is not new to General Electric engineers. Nine years ago, Dr. E. F. W. Alexanderson—one of the G-E consulting engineers and an ex-Test man—and his assistants demonstrated television to a theater audience in Schenectady. But great advances have been made since then, and when you act for your friends at New York you will be using the latest equipment that science has to offer.



NOW YOU SEE IT– NOW YOU DON'T

IN THE G-E Research Laboratory, at Schenectady, there is a framed photograph which at first glance does not appear to be unusual in any way. But when it is viewed from an angle at which the glare of light reflected from the glass becomes noticeable, the picture does tricks—part of it becomes almost obscured by the glare, yet the rest remains clearly visible.

The explanation is that each surface of the clear portions of the glass is coated with a transparent film—a film four millionths of an inch thick, or one-quarter wave length of light, and having the proper refractive index. These films, recently developed by G-E scientists, cause the light rays reflected from the film surfaces to counteract one another. The reflection of light from the glass is thereby prevented.

Whereas the process is still in the laboratory stage, it is believed that it will soon be available for many optical uses.

GENERAL ELECTRIC

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